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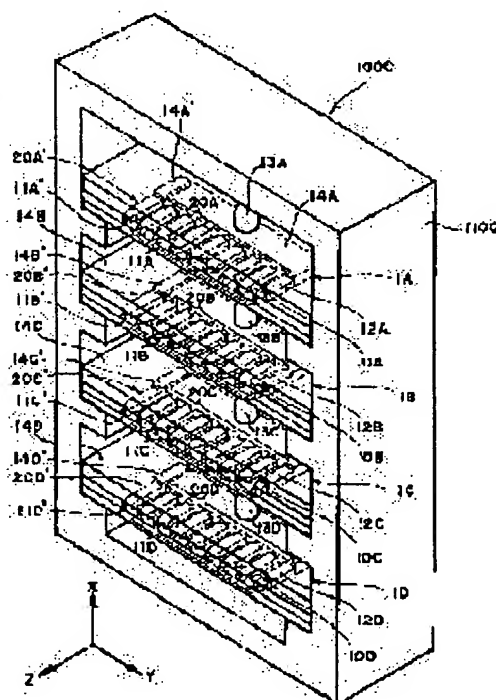
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(54) INK JET RECORDING HEAD AND INK JET RECORDING APPARATUS LOADED THEREWITH

(57)Abstract:

PROBLEM TO BE SOLVED: To easily enable the positioning adjustment between recording heads in an ink jet recording head having such a form that a plurality of recording heads are held in parallel to a holding member and an ink jet recording apparatus loaded therewith.

SOLUTION: A plurality of main recording elements 20A-20D arranged in parallel and emitting ink to perform recording and auxiliary recording elements 20A'-20D' emitting ink for the purpose of positioning are individually provided. The mutual positions of a plurality of the recording heads 1A-1D held to a recording head holding member 1100 are determined on the basis of the patterns formed by the ink droplets emitted from the auxiliary recording elements 20A'-20D'.



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CLAIMS

[Claim(s)]

[Claim 1] The ink jet recording head characterized by deciding the mutual location of two or more recording heads which a parallel arrangement is carried out, possess separately two or more main record components which record by breathing out ink, and the subrecord component which carries out the regurgitation of the ink for positioning, and are held at a recording head supporter based on the pattern formed on a recorded material by the ink droplet breathed out from said subrecord component.

[Claim 2] Said subrecord component is an ink jet recording head according to claim 1 characterized by being arranged in one [at least] edge of two or more of said main record components by which the parallel arrangement was carried out.

[Claim 3] The arrangement location to said main record component of said subrecord component is an ink jet recording head according to claim 1 or 2 characterized by the same thing in said two or more recording heads.

[Claim 4] Said subrecord component is an ink jet recording head given in claim 1 characterized by for plurality learning from array spacing of said main record component, and being arranged thru/or one term of 3.

[Claim 5] Said subrecord component is an ink jet recording head given in claim 1 characterized by arranging plurality at spacing of said main record component, and different spacing thru/or one term of 3.

[Claim 6] For said main record component, said subrecord component is an ink jet recording head given in claim 1 characterized by carrying out the regurgitation of the ink droplet of a different path thru/or one term of 5.

[Claim 7] For said subrecord component, the supply path of the ink which carries out the regurgitation is [said main record component] an ink jet recording head given in claim 1 to which it is characterized by differing thru/or one term of 6.

[Claim 8] Said main record component and said subrecord component are an ink jet recording head given in claim 1 characterized by carrying out the regurgitation of the ink of a different color according to a recording head thru/or one term of 7.

[Claim 9] For the array direction of said main record component and said subrecord component, said recording head supporter is an ink jet recording head according to claim 1 characterized by carrying out a relative-displacement scan in the crossing direction, and carrying out the regurgitation of the ink during this scan to said recorded material.

[Claim 10] Said pattern is an ink jet recording head according to claim 1 characterized by being formed of the ink droplet breathed out from the subrecord component of a different recording head during the relative-displacement scan of said recording head supporter.

[Claim 11] The mutual location of two or more of said recording heads is an ink jet recording head given in claim 8 characterized by deciding the existence of the color generated by superposition of the ink droplet of a different color in said pattern thru/or one term of 10.

[Claim 12] The ink jet recording device characterized by carrying the recording head of a publication in claim 1 thru/or one term of 11, having a recording mode and positioning mode, and carrying out the regurgitation of the ink only from said subrecord component at the time of this

positioning mode.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001] [Field of the Invention] This invention relates to an ink jet recording head and the ink jet recording device of this recording head loading.

[0002] [Description of the Prior Art] Conventionally, a record component is made to drive selectively according to the record signal inputted from a host side, and things, such as wire dot matrix printing, a hot printing method, and an ink jet method, are known as a recording apparatus which records on a recorded material (it is called a record sheet below). High definition image recording including printing is possible for the ink jet recording device which carries an ink jet recording head and performs discharge and record for ink from the ink delivery of the recording head concerned especially, and moreover, it is observed from it being cheap and being obtained, and is widely used for a field in every direction. The record component which consists of two or more ink deliveries, liquid ink ways, and regurgitation energy generation components especially is made to arrange in a detailed pitch, a recording head is constituted, and although the plurality of this recording head was made to arrange in parallel in the direction which intersects the array direction of a record component and color record and gradation record were enabled, need has also been quickly prolonged in recent years.

[0003] The example of a configuration of such a recording head for color record is shown in (A) of drawing 19, (B), and (C). Setting to drawing 19, for a recording head and 101, the substrate and 102 are [100] HfB2 as an exoergic resistive layer. For the common electrode of aluminum, and 104, the individual electrode of aluminum, and 105A and 105B of pattern wiring of aluminum and 106 are [a layer and 103 / an anti-oxidation layer and the photosensitive polyimide layer as an insulating layer, and 108] Ta layers as a cavitation-proof layer.

[0004] Heat energy can be generated and the exoergic resistive layer 102 can be made to generate heat energy by passing a current to the exoergic resistive layer 102 by the recording head 100 by leading an actuation current to the exoergic resistive layer 102 through the individual electrode 104 and pattern wiring 105A from a host side, and leading it to a host side through pattern wiring 105B and the common electrode 103 further. An ink jet recording device records by making a liquid breathe out using this heat energy.

[0005] Two or more formation of the regurgitation energy generation component (below, a heater element is called) 110 constituted by the combination of such each class is carried out at the recording head 100. Thus, two or more heater elements 110 are formed in a recording head 100, and the ink delivery 111 for making ink breathe out corresponding to each heater element 110 is formed as shown in (C) of drawing 19. The ink regurgitation is performed by the combination of a heater element 110, the ink delivery 111, and a liquid route 112 in this way, and this is hereafter called the record component 120. By arranging a majority of such record components 120 on the substrate 101 of one, it becomes possible to obtain the ink jet recording device which performs two or more dot records simultaneously, and two or more improvement in the speed can be attained.

[0006] The recording head 100 which it had become common that the request of high density

and high-speed record records 1 horizontal-scanning line simultaneously in high today especially, therefore has arranged many heater elements 110 to high density has come out to the commercial scene. In (C) of drawing 19, from a non-illustrated ink tank, ink is led to the common liquid room 140 with the ink supply tube 130, is further led to a liquid route 112 from here, and it is foamed in it by the heater element 110, and it is breathed out from the ink delivery 111. In addition, an actuation current is supplied to a heater element 110 with the pattern wiring 105A and 105B previously described from the wiring electrode 150.

[0007] The recording head unit 1000 for color record makes juxtaposition hold two or more recording heads 100 which become the above configurations to the head supporter 1100, as shown in drawing 20, supplies the ink of each color of black (BK), yellow (Y), a Magenta (M), and cyanogen (C) to each recording head 100, and performs color record in the combination of these colors. Moreover, drawing 21 carries such a recording head unit 1000 in carriage 1200, and shows the example of a configuration of the color ink jet recording device which records by breathing out above-mentioned color ink from each recording head 100 during horizontal scanning of the direction of X in alignment with the advice shaft 1210 of carriage 1200. While the screw gear to which 1220 makes a main scanning direction carry out both-way migration of the carriage 1200, the drive motor with which 1230 carries out the actuation revolution of the screw gear 1220, and 1240 hold record sheet P in a record location, whenever record is performed by one scan by carriage 1200, sheet delivery of the record sheet P is carried out, and the platen roller in connection with conveyance and 1250 are sheet presser feet further.

[0008] By the way, as shown in drawing 20, in order to make the head supporter 1100 carry out juxtaposition maintenance of two or more recording heads 100 and to constitute the recording head unit 1000, it is necessary to position to accuracy between each recording head 100 which records by breathing out the ink droplet according to color to the direction of Y which is the direction of vertical scanning, i.e., the sheet feed direction of record sheet P, (register doubling). A color gap occurs that this register doubling is poor, and color picture record grace is reduced remarkably. For example, the example of record of the case where the register doubling is performed ideally, and the case where register doubling is based on a defect's head is indicated to be (A) to drawing 22 by (B) fixing two recording heads, A and B, 100 to the head supporter 1100. Thus, in (B) with a location gap, a color gap arises between record by Head A, and record by Head B at the time of horizontal scanning of the direction of X.

[0009] On the other hand, if high degree of accuracy comes to be increasingly required of the register doubling and it hits carrying out register doubling of two or more recording heads 100 to the head supporter 1100 in connection with highly-minute-izing of record by the ink jet recording head, and densification, the fixed position to the head supporter 1100 of the recording head 100 of these plurality is checked, and the method which performs positioning of each recording head is taken by the end of today according to the result.

[0010] As a symptom of the fixed position to the head supporter 1100 of two or more recording heads 100 (1) The alignment mark recorded on a part of each recording head 100 is observed using a direct microscope etc. "Direct observation method" (2) each recording head 100 which measures the distance from the reference point of the head supporter 1100 to the head supporter 1100 A tacking meal, He is trying to adjust the location of each recording head 100 based on the positional information of the record component of two or more recording heads 100 from which two kinds of the "test pattern methods" checked based on the record result carried out conventionally, and were acquired by ***** cages and these approaches.

[0011] Moreover, the two approaches of the "electric shift approach" which carries out sequential actuation of the record component 20 which records by shifting electrically the record data inputted into the (approach b) record component 120 which shifts the recording head 100 of (a) each directly to the head supporter 1100 as preparation of each recording head 100, and is refined one by one in the direction of vertical-scanning Y are conventionally well-known. ["mechanical shift approach"]

[0012]

[Problem(s) to be Solved by the Invention] However, there were the following troubles in the above-mentioned recording head location symptom (1) and (2).

[0013] (1) Equipments, such as a microscope for carrying out direct observation of the alignment mark in a recording head 100, are required for the direct observation approach this gentleman method, and the attachment activity to the recording head supporter 1100 of a recording head 100 is limited to works with such equipment etc.

[0014] (2) Since the test pattern method this gentleman method is an approach of checking the record result by the record component 120, operation by the recording head which performs detailed record is difficult for it. For example, it is the detailed point that a record dot is 20-30 micrometers per element in the recording head which records a 1200DPI consistency, and it is dramatically difficult to check the location of such a detailed point, moreover, yellow -- in addition, in the localization of the recording head which records special ink, such as ultraviolet-rays luminescence ink, since the visibility of record ink is low, it becomes difficult to check [of the location of a recording head] a check by looking of the record result on a test pattern difficult therefore.

[0015] Paying attention to the conventional trouble which was mentioned above, the object of this invention has the record component and test pattern mode for checking a register doubling condition in the ink jet recording head and ink jet recording apparatus of a gestalt with which juxtaposition maintenance of two or more recording heads is carried out as a unit, and enables positioning adjustment between recording heads easily so that it may aim at the solution.

[0016]

[Means for Solving the Problem] The parallel arrangement of the ink-jet recording head which starts this invention in order to attain this object is carried out, it possesses separately two or more main record components which record by breathing out ink, and the subrecord component which carry out the regurgitation of the ink for positioning, and is characterized by to be decided the mutual location of two or more recording heads held at a recording head supporter based on the pattern formed on a recorded material by the ink droplet breathed out from said subrecord component.

[0017] Moreover, the ink jet recording device of recording head loading concerning this invention has a recording mode and positioning mode, and is characterized by carrying out the regurgitation of the ink only from said subrecord component at the time of this positioning mode.

[0018] According to this invention ink jet recording head and the ink jet recording device of this recording head loading it is what judges the correction of the location based on the pattern which drove only the subrecord component of each recording head, was made to breathe out ink, and was formed of the ink droplet on the recorded material at the time of positioning of each recording head to a recording head supporter. Compared with positioning performed by driving two or more main record components for record like before, checking [of register doubling] by looking does not need to become easy and it is not necessary to consume ink unnecessarily.

[0019]

[Embodiment of the Invention] Below, based on a drawing, the example of this invention is explained concretely.

[0020] Drawing 1 shows the configuration of the recording head by the 1st example of this invention, and a recording head unit. In this example, recording heads 1A, 1B, 1C, and 1D should carry out the regurgitation of the ink of four colors of Bk, C, M, and Y according to the color, respectively, and each recording heads 1A-1D are equipped with record component (henceforth subrecord component) 20A' used for a left end only at the time of test pattern record as shown in this drawing - 20D'. Moreover, 20A-20D are record components (henceforth the main record component) used at the time of a recording mode, and the heater element by which 10A-10D are prepared in the liquid routes 12A-12D of each main record components 20A-20D, and 11A-11D are [an ink supply tube, and 14A-14D of an ink delivery (it is called the main ink delivery), and 13A-13D] common liquid rooms. In addition, it is not different from the conventional configuration shown in drawing 20 about the configuration of the ink supply tubes 13A-13D for supplying ink different, respectively to the main record components 20A-20D and these, and the common liquid rooms 14A-14D, and the explanation is omitted.

[0021] The description of this example is in the point of having prepared subrecord component

20A' - 20D'. Although subrecord component 20A' - 20D' and the main record components 20A-20D consist of same array consistencies in each recording heads 1A-1D, about the supply system and drive system of ink to subrecord component 20A' - 20D', the main record components 20A-20D are separated. 14A' - 14D' is a liquid room which supplies ink to subrecord component 20A' - 20D'.

[0022] Subsequently, the register doubling actuation to the head supporter 1100 at the time of the test pattern recording mode (positioning mode) of each recording heads 1A-1D which become such a configuration is explained, referring to drawing 2 - drawing 4.

[0023] The recording head (in this example, the recording head which carries out the regurgitation of the Bk ink so that it may be easy to check the record condition by looking is desirable), for example, recording head 1A, which serves as criteria of positioning to the 1st first at it is fixed to the positioning location of the head supporter 1100 as shown in (A) of drawing 2. The recording heads 1B, 1C, and 1D for C, M, and Y ink regurgitation are learned from after an appropriate time at the positioning location of recording head 1A, and carry out a temporary arrangement. The above operations sequence was shown in steps S1 and S2 of drawing 3. And drive subrecord component 20A' of these recording heads 1A-1D - 20D' at the following step S3, ink is made to breathe out continuously from each ink delivery (henceforth subink delivery) 11A'-11D', and a test pattern is recorded by these ink droplets. Step S4 is the process in which the recorded test pattern is evaluated, and judges the existence of the record gap of recording heads 1B-1D which carried out the temporary arrangement to recording head 1A in this process.

[0024] In order to make intelligible the above-mentioned assessment actuation in a test pattern, according to drawing 2 and drawing 3, only two of recording heads 1A and 1B are taken up and explained. As now shown in (A) of drawing 2, when there is no gap of the direction of Y between recording head 1A, and recording head 1B Dot pattern 21B' which was breathed out towards the direction of X, i.e., a test-during horizontal scanning sheet, from subink delivery 11A', and was breathed out and recorded from dot pattern 21A' and subink delivery 11B' which were recorded is formed on the same line, as shown in (A) of drawing 4. However, as shown in (B) of drawing 2, when a gap of the direction of Y is between recording head 1A and recording head 1B, as shown in (B) of drawing 4, dot pattern 21A' and dot pattern 21B' do not come on the same line, but only the amount SP of gaps shown in (B) of drawing 2 will shift. In addition, although drawing 2 and drawing 4 explained only the gap of recording head 1B which carried out the temporary arrangement to recording head 1A used as criteria, the same judgment can be made about the test pattern also to other recording heads 1C and 1D by which the temporary arrangement was carried out.

[0025] When it is assessment that there is no gap of the direction of Y between recording head 1A - 1D in this way in step S4 shown in drawing 3 as a result of test pattern record, it progresses to step S6, and when either 1B-1D have shifted to recording head 1A, it branches to step S5 and positioning corresponding to each amount of gaps is performed to the recording head which has shifted. And where a gap is lost, in step S6, positioning immobilization of the recording heads 1B-1D is carried out, and register doubling actuation of recording heads 1A-1D is ended.

[0026] Drawing 5 shows the 2nd example of this invention. This example makes two pieces subrecord component 20A' - 20D' in each recording heads 1A-1D, respectively. There are not it which was not different from the configuration shown in drawing 1 other than having supplied ink to these two subrecord components 20A', 20A'-20D', and 20D' from one liquid room 14A'-14D', respectively, and also showed the procedure of register doubling to drawing 3, and a changing place. However, since according to this example ink is simultaneously breathed out from adjoining two subink delivery 11A', 11A'-11D', and 11D' and a test pattern is formed in the pattern assessment corresponding to (A) and (B) of drawing 4, as shown in (A) of drawing 6, and (B) Each of subink delivery 11A', dot pattern 22A' from 11A', and subink delivery 11B' and dot pattern 22B' from 11B' are formed thickly. It can be made easy to check by looking thickly compared with the case where a subrecord component is made into one piece about each recording heads 1A-1D, and pattern assessment becomes easy.

[0027] In addition, although the number of the subrecord components prepared in each recording heads 1A-1D was made into every two adjoining pieces in the 2nd above-mentioned example, you may be not only two pieces but every three pieces. However, it is better to limit to the number of extent which is easy to check by looking since the number of the main record components will decrease to remainder so much, if the number of subrecord components is made [many].

[0028] The 3rd example is shown in drawing 7. This example makes what is in each both ends among the record components arranged in each recording heads 1A-1D subrecord component 20A'-20D'. The place by which it is characterized [of this example] is in the point which enabled the check by looking of the mutual parallelism between each recording head 1A-1D with the gap of the direction of Y. In addition, in order that the following may also give explanation intelligible, two recording heads 1A and 1B are taken up among recording heads 1A-1D, and register doubling assessment in the meantime is explained.

[0029] As opposed to recording head 1A by which positioning immobilization of the (A) of drawing 8 was carried out as criteria The condition that recording head 1B was positioned in the suitable location recording head 1B shifts in the direction of Y, and (B) of drawing 8 moreover, the condition that the temporary arrangement was carried out Although recording head 1B has not separated from (C) of drawing 8 to the direction of Y to recording head 1A, recording head 1B is not parallel to recording head 1A, but it shows the condition of having been inclined and tacking carried out only of the include-angle theta** to right going up in this drawing further again, respectively. However, the graphic display and explanation are omitted only by learning from the pattern shown in (A) of drawing 4, and (B), and such a pattern being formed in the both ends of recording heads 1A and 1B about the dot pattern when being carried out in the condition of (A) and (B) in the case of a lever.

[0030] Drawing 9 shows the dot pattern obtained when recording head 1A and recording head 1B are maintained at the condition which shows in (C) of drawing 8. In order that [namely,] there may be no gap of the direction of Y between recording head 1A and recording head 1B --- (C) of drawing 8 --- each of recording heads 1A and 1B --- it has been arranged at the left end --- secondary --- record component 20A'1 and 20B'1 --- the dot pattern by 1 is formed on a straight line, as shown in drawing 9 as 21A'1 and 21B'1. However, since it has angle-of-inclination theta** to recording head 1A as recording head 1B shows (C) of drawing 8 it has been arranged at the right end --- secondary --- the dot pattern by record component 20A'2 and 20B'2 --- drawing 9 --- 21A' --- 2 and 21 --- parts overlap, or when angle-of-inclination theta** is an opposite direction, space is generated between 21A'2 and 21B'2, so that it may be shown as B'2. Therefore, what is necessary is just to correct the temporary arrangement condition of each recording heads 1B-1D based on the condition of such a dot pattern.

[0031] Drawing 10 shows the 4th example of this invention. This example prepares every two subrecord component 20A', 20A'-20D', and 20D' in each recording heads 1A-1D, respectively in the same pitch as the both ends of the main record components 20A-20D. Then, according to this example, the register doubling effectiveness which the register doubling effectiveness which the 2nd example of drawing 5 described by the way, and the 3rd example of drawing 8 described by the way can be doubled and acquired.

[0032] Drawing 11 shows the 5th example of this invention. The place by which it is characterized [of this example] is to have arranged two or more subrecord component (this example two pieces) 20A', 20A'-20D', and 20D' to the both ends of the main record components 20A-20D, respectively while changing array-pitch PM of the main record component, and array-pitch PD of a subrecord component, as shown in drawing 12, and it is made into the pitch PD>pitch PM here. In this way, as the dot pattern by the ink regurgitation from subrecord component 20A', 20A'-20D', and 20D' shows to drawing 13, ink dots do not overlap like [as an adjacency **** record component, for example, 20A', and 20A']. Therefore, for example, these two subrecord components 20A', dot train pattern 21A' by 20A', 21A'. Or in subrecord component 20B', dot pattern train 21B' by 20B', and 21B', the effectiveness which it is all ineffective to the pattern of two trains, and raises a continuity and discontinuous visibility further is acquired.

[0033] In addition, DPG shown in (A) of drawing 13 is a test pattern as shown in (A) of drawing

12, when recording head 1A and recording head 1B are positioned by accuracy. As DPN shown in (B) of drawing 13 is shown in (B) of drawing 12, to recording head 1A, it is a test pattern when carrying out a location gap in the direction of recording head 1B or Y, and, only in the amount of gaps, the dot train has shifted in the direction of Y in 21A', 21A', and 21B' and 21B', respectively.

[0034] Drawing 14 shows the 6th example of this invention. The place by which it is characterized [of this example] is the point that the magnitude of the record dot formed in the ink breathed out from delivery 11A' of subrecord component 20A'] differs from the magnitude of the record dot formed in the ink breathed out from delivery 11of main record component 20A. A, if the magnitude of a record dot becomes large as shown in (A) of drawing 15, the visibility of a record dot will be raised in the test pattern DPN in case a gap is, for example among recording heads 1A and 1B. Conversely, although the visibility of record dot each will become low if magnitude of a record dot is made small as shown in (B) of drawing 15, register doubling of high degree of accuracy becomes more possible by observing a test pattern DPN under a microscope etc. That is, what is necessary is just to set up the magnitude of a record dot according to the register doubling precision of a recording head demanded.

[0035] In addition, as an approach of changing the magnitude of a record dot, although the magnitude of the delivery of the main record components 20A-20D and subrecord component 20A' - 20D' was changed in this example As long as it is the case of the ink jet recording head of Bubble Jet, the size of the heater element 110 (refer to drawing 20) for making ink foam may be changed, and the electrical potential difference or pulse width of a driving pulse impressed to a heater element 110 may be changed into others.

[0036] Thus, according to this example, a register doubling test pattern with high visibility or the test pattern which performs register doubling of high degree of accuracy can be given by changing the magnitude or the configuration of a record dot by subrecord component 20A' - 20D' with the record dot by the main record components 20A-20D.

[0037] Drawing 16 shows the 7th example of this invention. It is in having arranged subrecord component 20A' of plurality [both ends] respectively - 20D' of the main record components 20A-20D] in each recording heads 1A-1D, and moreover the place by which it is characterized [of this example] having changed the array pitch of these secondary record component with PA, PB, and --- for every recording head. In addition, array-pitch P in the main record components 20A-20D is taken as a thing as originally set up. The test pattern DPA as shown in (A) of the field sign 17 to which register doubling of the recording heads 1A and 1B was correctly carried out as a test pattern obtained by this example as shown in (A) of drawing 16 is obtained. Moreover, when becoming the test pattern DPN as shown in (B) of drawing 17 and carrying out register doubling of other recording heads 1B-1D to recording head 1A, the case of poor register doubling can make each good and defect legible, and can attain high-degree-of-accuracy-ization.

[0038] Drawing 18 shows the example of the dot pattern obtained from subrecord component 20A' and 20B' according to the 8th example of this invention. The place by which it is characterized [of this example] is in recording heads 1A-1D to breathe out the ink of a color in which each subrecord component 20A' - differs from 20D', and form a test pattern. In addition, although not illustrated about the configuration of the recording head by this example, and a recording head unit, it is constituted like the example described so far, and other examples can be applied also about the number or the size of an ink dot formed. However, it was made to make the ink in which the colors in which each recording heads 1A-1D carry out the regurgitation differ breathe out in this example from the subrecord component per piece prepared in the both ends of each main record component.

[0039] In addition, it is what a test pattern is recorded on as different ink which are breathed out from the subrecord component of a different recording head in the case of this example is overlapped. For example, when the dot pattern by the subrecord component which carries out the regurgitation of the cyanogen ink (C) to the subrecord component which carries out the regurgitation of the Magenta ink (M) is register doubling between normal both heads, as a slash is given and shown in (A) of drawing 18 When cyanogen dot line 21C and Magenta dot line 21M are

overlapped, the blue test pattern DPA by color mixture is obtained. However, when register doubling between normal both heads is not obtained, as shown in (B) of drawing 18, dot line 21C of the dot line 21M and cyanogen of a Magenta serves as the test pattern DPN recorded as another line. By this example, in order to give explanation intelligible, the case of the test pattern recorded by the subrecord component which carries out the regurgitation of the cyanogen ink to the subrecord component which carries out the regurgitation of the Magenta ink was stated, but even if it is combination, such as black, cyanogen and black, and a Magenta, etc., for example, the quality of register doubling can be judged by same dot pattern record.

[0040]

[Effect of the Invention] As explained above, according to this invention ink jet recording head and the ink jet recording device of this recording head loading two or more main record components which a parallel arrangement is carried out and record by breathing out ink, and the subrecord component which carries out the regurgitation of the ink for positioning are provided separately. Since the mutual location of two or more recording heads held at a recording head supporter is decided based on the pattern formed on a recorded material by the ink droplet breathed out from said subrecord component Positioning between recording heads can be easily carried out at the time with [to a recording head supporter / each] a recording head group and of exchange of this recording head, and it contributes to improvement in workability, and cost reduction.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the perspective view showing the configuration of the recording head unit by the 1st example of this invention.

[Drawing 2] It is the front view showing the positioning condition between two recording heads by the example (B) of a right condition (A) and a defect condition among the recording head units shown in drawing 1 .

[Drawing 3] It is the flow chart which shows the procedure of the fundamental positioning actuation by this invention.

[Drawing 4] It is the explanatory view showing the quality of the test pattern by the 1st example of this invention by two examples, (A) and (B).

[Drawing 5] It is the perspective view showing the configuration of the recording head unit by the 2nd example of this invention.

[Drawing 6] It is the explanatory view showing the quality of the test pattern between two recording heads by the 2nd example by two examples, (A) and (B).

[Drawing 7] It is the perspective view showing the configuration of the recording head unit by the 3rd example of this invention.

[Drawing 8] It is the front view showing the positioning condition between two recording heads by the 3rd example by two examples (B), a good condition (A) and a defect condition, and (C).

[Drawing 9] It is the explanatory view showing the defect of the test pattern by the condition of (C) of drawing 8 .

[Drawing 10] It is the perspective view showing the configuration of the recording head unit by the 4th example of this invention.

[Drawing 11] It is the perspective view showing the configuration of the recording head unit by the 5th example of this invention.

[Drawing 12] It is the front view showing the positioning condition between two recording heads by the 5th example by two examples, a right condition (A) and a defect condition (B).

[Drawing 13] It is the explanatory view showing the quality of the test pattern by the 5th example by two examples, (A) and (B).

[Drawing 14] It is the perspective view showing the configuration of the recording head unit by the 6th example of this invention.

[Drawing 15] It is the explanatory view showing the quality of the test pattern by the 6th example by two examples, (A) and (B).

[Drawing 16] It is the front view showing the positioning condition between two recording heads by the 7th example of this invention by two examples, a right condition (A) and a defect condition (B).

[Drawing 17] It is the explanatory view showing the quality of the test pattern by the 7th example by two examples, (A) and (B).

[Drawing 18] It is the explanatory view showing the quality of the test pattern by the 8th example of this invention by two examples, (A) and (B).

[Drawing 19] It is the explanatory view showing the fundamental configuration of an ink jet recording head typically by the A-A line sectional view (B) and perspective view (C) of a plan (A)

and (A).

[Drawing 20] It is the perspective view showing the example of a configuration of the conventional recording head unit.

[Drawing 21] It is the perspective view showing the example of a configuration of the serial mold ink jet recording device which can apply this invention.

[Drawing 22] It is the explanatory view showing the quality of the test pattern between two recording heads by the conventional example by two examples, (A) and (B).

[Description of Notations]

1A, 1B, 1C, 1D Recording head

10A-10D Heater element

11A-11D Main ink delivery

11A'-11D' Subink delivery

12A-12D Liquid route

13A-13D Ink supply tube

14A-14D Common liquid room

14A'-14D' Liquid room

20A-20D Main record component

20A', 20B', 20C', 20D', 20A'1, 20B'1, 20A'2, 20B'2 Subrecord component

21A', 21B', 21A'1, 21B'2 Dot pattern

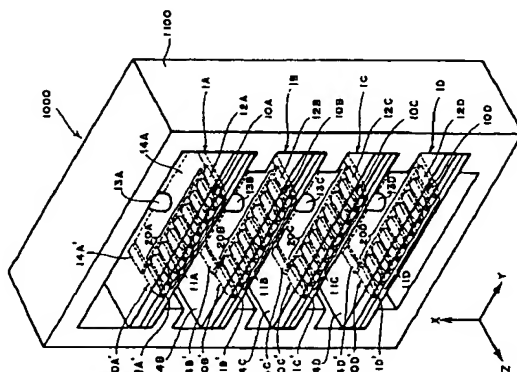
2M, 21C Dot line

22A', 22B' Dot pattern

DPG, DPA Test pattern

P, PA, PB Array pitch

[Translation done.]



【0025】かくして、図3に示すステップS4においてテストパターン記録の結果記録ヘッド1A～1D間にY方向のずれが無いとの評価の場合はステップS6に進み、記録ヘッド1Aに対し、1B～1Dのいずれかについて、記録ヘッド1Aに対し、1B～1Dのずれが無いとの評価の場合はステップS5に分支してそのずれがある記録ヘッドに対し、それぞれのずれ量に対応する位置調整を行う。そして、ずれを無くした状態でステップS6において記録ヘッド1B～1Dを位置決め固定し、記録ヘッド1A～1Dのレジ合わせ動作を終了する。

【0026】図5は本発明の第2の実施例を示す。本例は、各記録ヘッド1A～1Dにおいて、副記録素子20A'～20D'をそれぞれ2個とし、これら2個の副記録素子20A'、20A'～20D'、20D'にそれぞれ1個の液室14A'～14D'からインクを供給するようにした以外は図1に示した構成と変わらず、また、レジ合わせの手順についても図3に示したそれと変わるところはない。ただし、本実施例によれば、隣接する2つの副インク吐出口11A'、11A'～11D'、11D'から同時にインクを吐出してテストパターンを形成するので、図4の(A)、(B)に示すように、副インク吐出口11A'、11A'、11A'からのドットパターン22A'と副インク吐出口11B'、11B'からのドットパターン22B'とが、いずれも太く形成され、副記録素子を各記録ヘッド1A～1Dについて1個とした場合に比べて太く視認し易くすることができ、パターン評価が容易となる。

【0027】なお、上述の第2実施例では個々の記録ヘッド1A～1Dに設ける副記録素子の数を隣接する2個ずつとしたが、2個に限らず、例えば3個ずつであってもよい。ただし、余りに副記録素子の数を多くすると、それだけ主記録素子の数が減るので視認し易い程度の数にとどめる方がよい。

【0028】図7に第3の実施例を示す。本例は各記録ヘッド1A～1Dにおいて配列される記録素子のうち、それぞれの両端部にあるものを副記録素子20A'～20D'としたものである。本例の特徴とするところは各記録ヘッド1A～1D間の相互平行性をY方向のずれと共に視認可能とした点にある。なお、以下でも説明を分り易くするために、記録ヘッド1A～1Dのうち2つの記録ヘッド1A、1Bを取り上げてその間のレジ合わせ評価について説明する。

【0029】図8の(A)は基準として位置決め固定された記録ヘッド1Aに対し、記録ヘッド1Bが逐次位置に位置決めされた状態を、また、図8の(B)は記録ヘッド1BがY方向にずれて仮決めされた状態を、さらに図8の(C)は記録ヘッド1Aに対し記録ヘッド1BがY方向に対してはずれていないものの記録ヘッド1Bが記録ヘッド1Aに対し平行とならず、角度 θ° だけこの図で右上りに傾斜して仮決めされた状態を、それぞ

【0033】なお、図13の(A)に示すDPGは図12の(A)に示すように記録ヘッド1Aと記録ヘッド1Bとが正確に位置決めされた時のテストパターンである。

り、図13の(B)に示すDPNは図12の(B)に示すように記録ヘッド1Aに対し記録ヘッド1BがY方向に位置決めされた時のテストパターンである、そのずれ量だけ21A'、21A'と21B'、21B'とではY方向にドット列がそれぞれずれている。

【0034】図14は本発明の第6の実施例を示す。本実施例の特徴とするところは、副記録素子20A'の吐出口11A'から吐出されたインクで形成される記録ドットの大きさが、主記録素子20Aの吐出口11Aから吐出されたインクで形成される記録ドットの大きさと異なる点である。図15の(A)のように記録ドットの大きさが大きくなると、例えば記録ヘッド1Aと1Bとの間にずれがある時のテストパターンDPNにおいて記録ドットの視認性が高められる。逆に図15の(B)に示すように記録ドットの大きさを小さくすると、記録ドット一つ一つの視認性は低くなるが、テストパターンDPNを顕微鏡等で観察することにより、より高精度のレジ合わせが可能となる。つまり、要求される記録ヘッドのレジ合わせ精度に合わせて記録ドットの大きさを設定するようにすればよい。

【0035】なお、記録ドットの大きさを変える方法として、本実施例では、主記録素子20A～20Dと副記録素子20A'～20D'との吐出口の大きさを異なるようにしたが、他にも、例えば、パブルジェットのインクジェット記録ヘッドの場合であれば、インクを発泡させるための発熱素子110(図20参照)のサイズを変えても良いし、発熱素子110に印加する駆動パルスの電圧あるいはパルス幅を変えても良い。

【0036】このように、本実施例によれば、副記録素子20A'～20D'による記録ドットの大きさはあるいは形状を主記録素子20A～20Dによる記録ドットと異ならせることにより、視認性の高いレジ合わせテストパターン、あるいは、高精度のレジ合わせを行うテストパターンを与えることができる。

【0037】図16は本発明の第7の実施例を示す。本実施例の特徴とするところは個々の記録ヘッド1A～1Dにおいて、主記録素子20A～20Dのそれぞれ両端部に複数の副記録素子20A'～20D'を配設し、しかも記録ヘッド1Aと1Bとが正しくレジ合わせされた場合図17の(A)に示すようなテストパターンDPAが得られる。また、レジ合わせ不良の場合は、例えば図17の(B)に示すようなテストパターンDPNとなり記録ヘッド1Aに対して他の記録ヘッド1B～1Dをレジ合わせする場合、それぞれの良・不良を見やすくし、また高精度化を図ることができる。

【0038】図18は本発明の第8の実施例により副記録素子20A'、20B'から得られたドットパターンの例を示す。本実施例の特徴とするところは、記録ヘッド1A～1Dにおいて、それぞれの副記録素子20A'～20D'が異なる色のインクを吐出してテストパターンを形成することにある。なお、本実施例による記録ヘッドおよび記録ヘッドユニットの構成については図示しなかったが、これまでに述べてきた実施例と同様に構成されるもので、その数や形成されるインクドットの大きさについても他の実施例を適用することができる。ただし、本実施例では個々の記録ヘッド1A～1Dが吐出する色の異なるインクをそれぞれの主記録素子の両端部に設けた1個ずつの副記録素子から吐出させるようにした。

【0039】なお、本実施例の場合、異なる記録ヘッドの副記録素子から吐出される異なるインク同士が重なるようにテストパターンが記録されるもので、例えばマゼンタインク(M)を吐出する副記録素子とシアングリーンインク(C)を吐出する副記録素子とによるドットパターンが正常な双方ヘッド間のレジ合わせの場合は図18の

(A)に斜線を施して示すようにシアングリーン21Cとマゼンタドットライン21Mとが重なることにより青色のテストパターンDPAが得られ、しかし、正常な双方ヘッド間のレジ合わせが得られなかった場合は、図18の(B)に示すようにマゼンタのドットライン21Mとシアンのドットライン21Cとが別のラインとして記録されるテストパターンDPNとなる。本実施例では説明を分り易くするためにマゼンタインクを吐出する副記録素子とシアングリーンを吐出する副記録素子とによって記録されるテストパターンの場

合について述べたが、例えばブラックとシア、ブラックとマゼンタ、といった組合せなどであっても同様なドットパターン記録によりレジ合わせの良否を判断することができ。

【0040】

【発明の効果】以上説明してきたように、本発明インクジェット記録ヘッドおよび副記録ヘッド搭載のインクジェット記録装置によれば、並列配座され、インクを吐出して記録を行う複数の主記録素子と、位置決めのためにインクを吐出する複数の副記録素子とを個々に具備し、記録ヘッド保持体に保持される複数の記録ヘッドの相互位置が前記副記録素子から吐出されたインク滴によって被記録材上に形成されるパターンに基づいて決定されるので、記録ヘッド保持体への各記録ヘッド組付時および記録ヘッドの交換時に記録ヘッド間の位置決めを容易に実施することができ、作業性の向上、コスト低減に貢献する。

【図面の簡単な説明】

【図1】本発明の第1実施例による記録ヘッドユニットの構成を示す斜視図である。

【図2】図1に示す記録ヘッドユニットのうち2つの記録ヘッド間の位置決め状態を良好状態(A)、不良状態(B)によって示す正面図である。

【図3】本発明による基本的な位置決め動作の手順を示すフローチャートである。

【図4】本発明の第1実施例によるテストパターン1の良否を(A)、(B)の2例で示す説明図である。

【図5】本発明の第2実施例による記録ヘッドユニットの構成を示す斜視図である。

【図6】第2実施例による2つの記録ヘッド間のテストパターン1の良否を(A)、(B)の2例で示す説明図である。

【図7】本発明の第3実施例による記録ヘッドユニットの構成を示す斜視図である。

【図8】第3実施例による2つの記録ヘッド間の位置決め状態を良好状態(A)および不良状態(B)および(C)で示す正面図である。

【図9】図8の(C)の状態によるテストパターン1の不良を示す説明図である。

【図10】本発明の第4実施例による記録ヘッドユニットの構成を示す斜視図である。

【図11】本発明の第5実施例による記録ヘッドユニットの構成を示す斜視図である。

【図12】第5実施例による2つの記録ヘッド間の位置決め状態を良好状態(A)および不良状態(B)の2例で示す正面図である。

【図13】第5実施例によるテストパターン1の良否を(A)、(B)の2例で示す説明図である。

【図14】本発明の第6実施例による記録ヘッドユニットの構成を示す斜視図である。

【図15】第6実施例によるテストパターン1の良否を(A)、(B)の2例で示す説明図である。

【図16】本発明の第7実施例による2つの記録ヘッド間の位置決め状態を良好状態(A)および不良状態(B)の2例で示す正面図である。

【図17】第7実施例によるテストパターン1の良否を(A)、(B)の2例で示す説明図である。

【図18】本発明の第8実施例によるテストパターン1の良否を(A)、(B)の2例で示す説明図である。

【図19】インクジェット記録ヘッドの基本的構成を模式的に上面図(A)、(A)のA-A線断面図(B)および斜視図(C)によって示す説明図である。

【図20】従来の記録ヘッドユニットの構成例を示す斜視図である。

【図21】本発明の適用可能なリアルタイムインクジェット記録装置の構成例を示す斜視図である。

【図22】従来の例による2つの記録ヘッド間のテストパターン1の良否を(A)、(B)の2例で示す説明図である。

【符号の説明】

1A, 1B, 1C, 1D 記録ヘッド

10A~10D 焼結素子

11A~11D 主インク吐出口

11A'~11D' 副インク吐出口

12A~12D 液路

13A~13D インク供給チューブ

14A~14D 共通液室

14A'~14D' 液室

20A~20D 主記録素子

20A', 20B', 20C', 20D', 20A', 20A'

1, 20B' 1, 20A' 2, 20B' 2

21A', 21B', 21A' 1, 21B' 2

ドットパターン

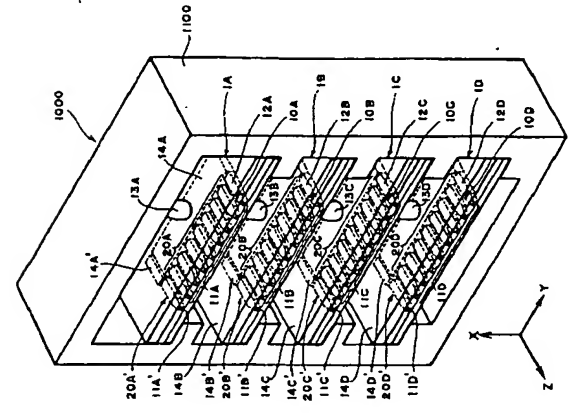
20M, 21C ドットライン

22A', 22B' ドットパターン

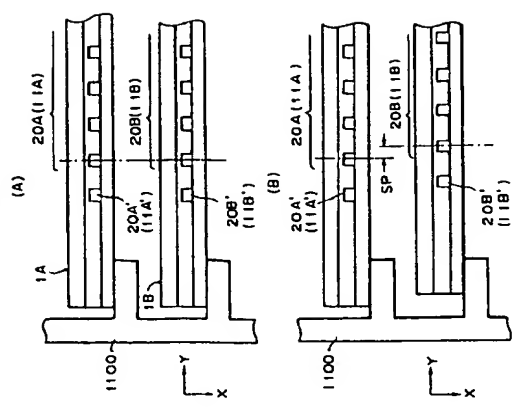
DPA, DPA テストパターン

P, PA, PB 配列ピッチ

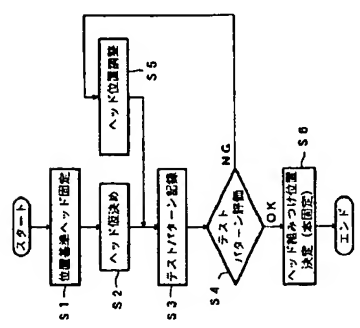
【図1】



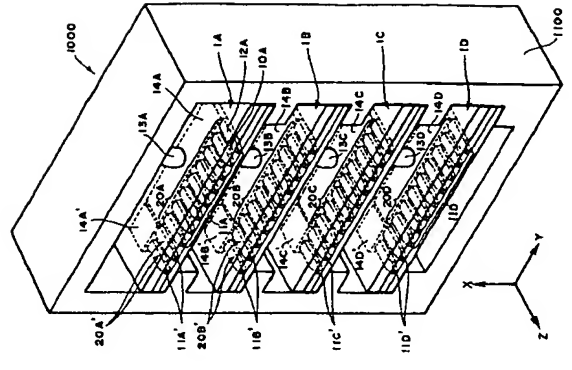
【図2】



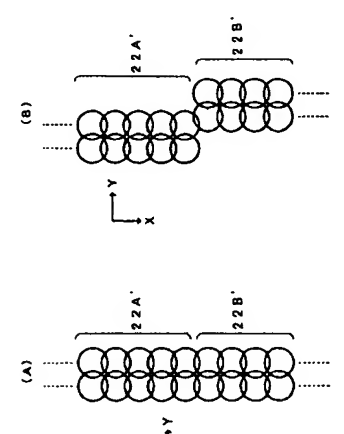
【図3】



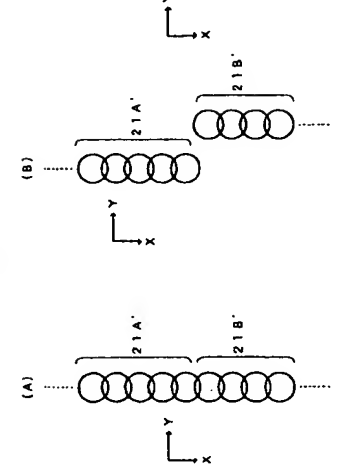
【図5】

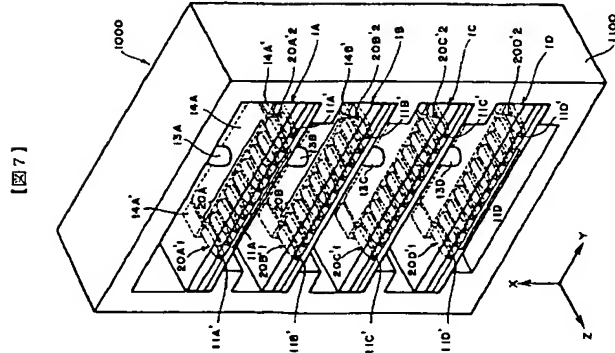


【図6】

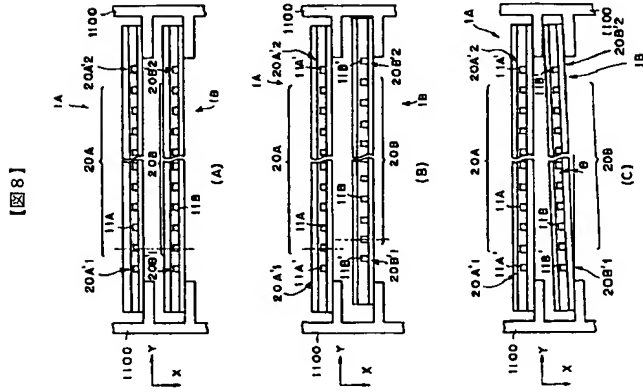


【図4】

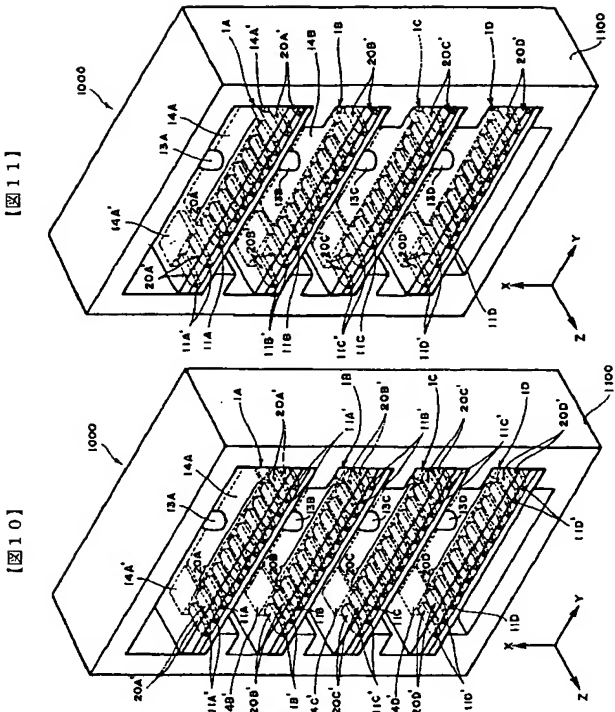




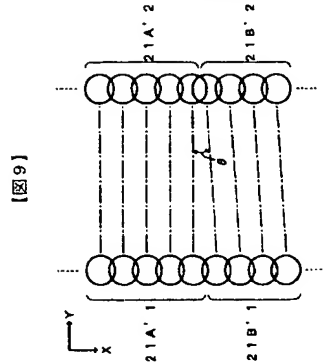
【図7】



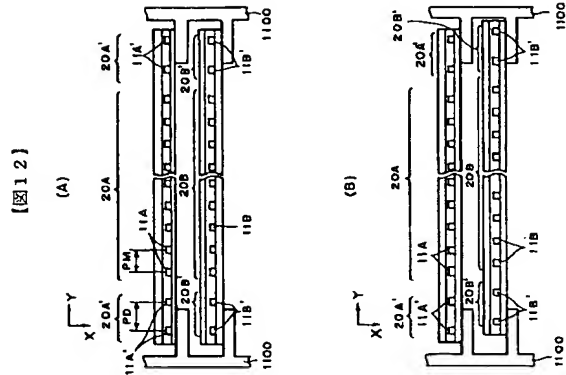
【図10】



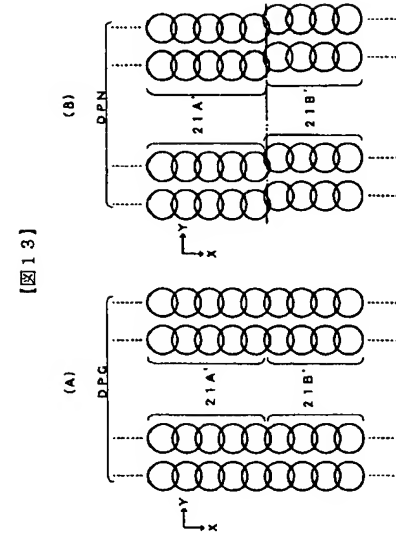
【図11】



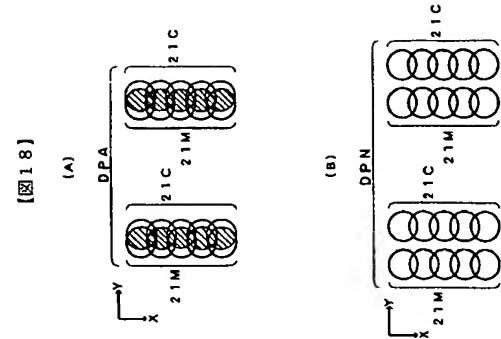
【図9】



【図12】

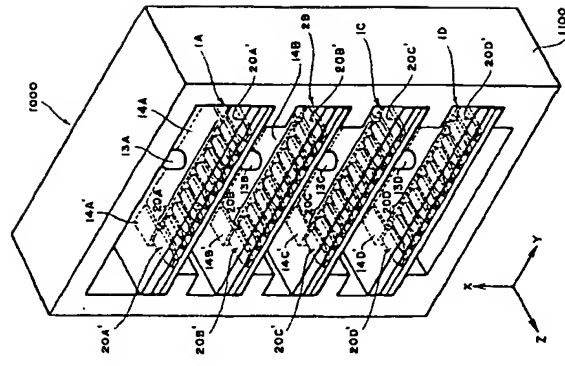


【図13】

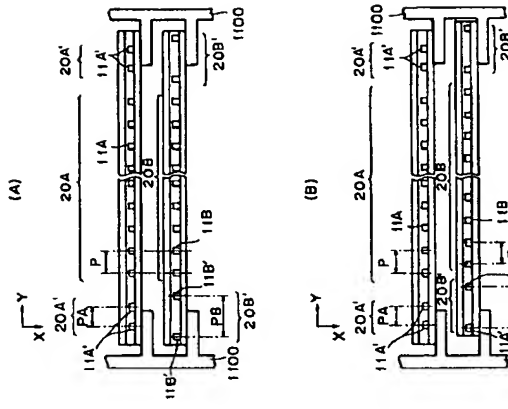


【図18】

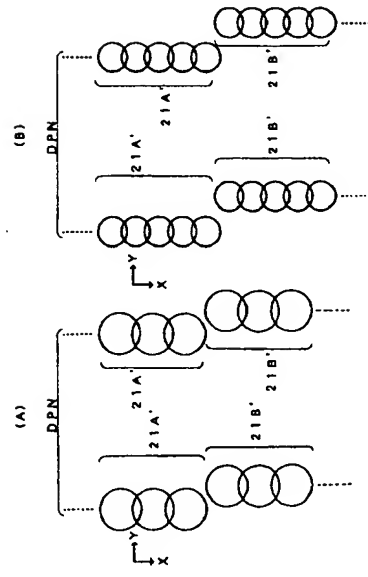
【図14】



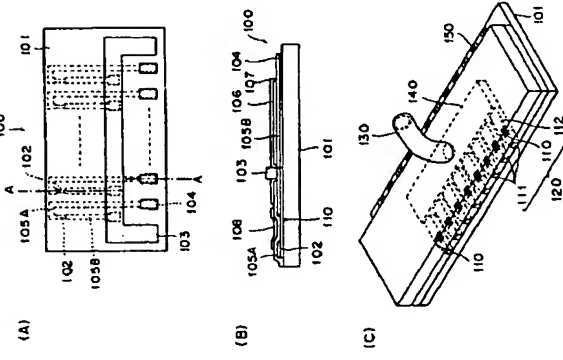
【図16】



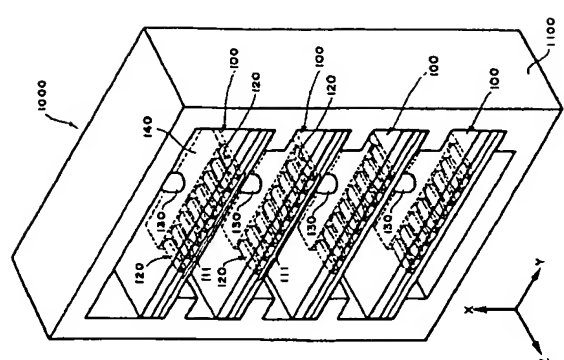
【図15】



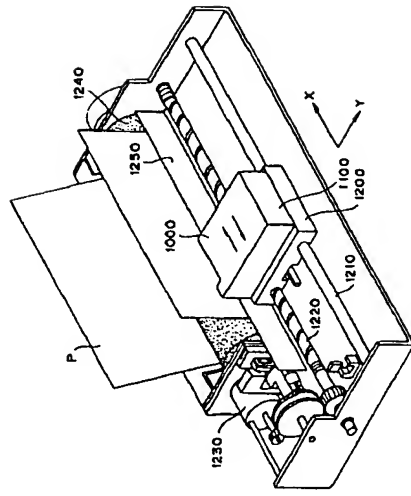
【図19】



【図20】



【図21】



【図22】

